

NASA

LANDSAT DATA USERS NOTES

UNITED STATES GEOLOGICAL SURVEY
EARTH RESOURCES OBSERVATION SYSTEMS DATA CENTER

SIOUX FALLS, SOUTH DAKOTA 57198

DATE: May 1978

ISSUE NO: 2

Landsat Micrographic Accession Aids System

Two new reference systems that will provide users with quick and inexpensive access to Landsat data have been developed by the EROS Data Center with support from the National Cartographic Information Center.

Called the Landsat microCATALOG and Landsat microIMAGE systems, these products use standard microfiche records to replace the paper catalogs and roll microfilm of "browse" images that previously were the basic reference tools for Landsat information.

Indexing for both microfiche systems is referenced to the Landsat Worldwide Reference System (WRS), a global network of *paths* and *rows* by which all Landsat scenes can be geographically located. With the Landsat 3 time frame, there are 251 *paths* and 248 *rows* in the WRS network, which provides an array of 62,248 *path-row* intersections (nominal scene centers) around which Landsat scenes can be clustered.

WRS indexes show the locations of all these "nominal scene centers". These indexes show both the daytime (descending node) centers and the nighttime (ascending node) centers. Using the WRS indexes for search and retrieval merely requires that the path-row intersections in the area of interest be identified. The appropriate microfiche can then be found in either the microCATALOG or microIMAGE file.

LANDSAT MICROIMAGE FICHE

The microIMAGE to be issued later in 1978, will be a daily record of all Landsat scenes acquired along a *path/zone*. Band 5 MSS images will be shown where available; Band 8 will be shown for Landsat-3 nighttime acquisitions. The Landsat microIMAGE offers several advantages over the 16mm roll microfilm "browse" record:

1. The microIMAGE is self-indexing, whereas the roll film requires an external index for cassette and frame location.
2. Each microIMAGE is dedicated to daily acquisitions along specified *paths*; images on roll microfilm are randomly sequenced.
3. The microIMAGE will be available for distribution within three weeks of scene acquisition; scenes on roll microfilm are delayed two-to-five months from date of acquisition.

The Landsat microCATALOG and microIMAGE fiche are divided into *zones* within the WRS. To achieve an acceptable image quality in the microIMAGE fiche, a maximum of 60 images per fiche can be recorded. *Zones*, therefore, reflect this grouping of microframe positions within each fiche. Each position is dedicated to a specific *row* within the *path* and *zone*. The *zone* organization is as follows:

North Zone (Day): 80° N. Lat. to the Equator, Rows 1-60

(Night): Equator to 80° N. Lat, Rows 184-243

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LANDSAT MICROFICHE SYSTEMS

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South Zone (Day): 28° N. Lat. to 57° S. Lat, Rows 41-100

(Night): 57° S. Lat to 28° N. Lat, Rows 144-203

The row overlap between north and south zones provides complete country coverage within one of these two Zones. The Polar Zone includes the rows that fall south of the South Zone boundary and north of the North Zone boundary.

LANDSAT MICROCATALOG FICHE

The microCATALOG is a cumulative listing of descriptions of all Landsat accessions indexed by *path* and *zone*. There is at least one microCATALOG for every *path/zone*; each microCATALOG is updated periodically until the number of listings (accessions) approaches the saturation limit of any microframe on the fiche. In such a case, date ranges are established to organize the number of accessions multiple microfiche records.

For example, North and Central America (*paths* 1 through 97 in the North Zone) consists of the following date ranges: 1972-74, 1975, 1976, 1977, and 1978. Thus five microCATALOG fiche are required to show complete historical Landsat coverage along a *path* in North America.

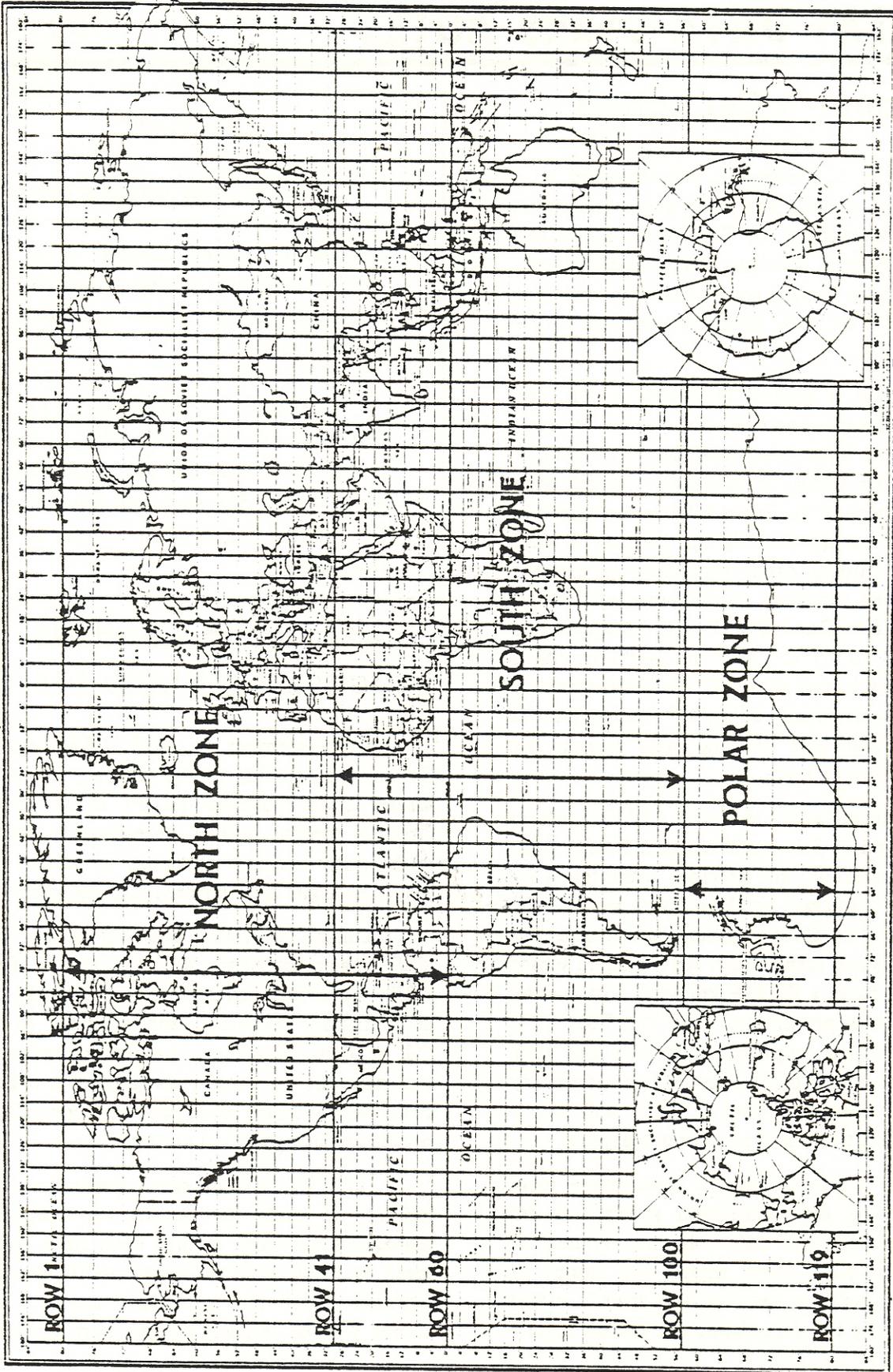
The Landsat microCATALOG is available from the EROS Data Center now. A packaging plan has been devised which allows users to tailor their catalog requirements to specific geographic areas. The microCATALOG can be ordered as a complete Current Catalog, or by one-year subscriptions. Individual fiche are priced at \$.20 with a \$5.00 minimum order. This price schedule is shown in the following table.

For smaller orders, note the *path/zone* of interest and multiply the total by \$.20. Twenty-five (25) microfiche can be ordered for the minimum \$5.00 charge. If selected date ranges are important, this should be specified. Send orders and/or inquiries to User Services, EROS Data Center, Sioux Falls, SD 57198.

	AREA	ONE-YEAR SUBSCRIPTION ¹		CUR. CATA. PRICE ²
		UPDATE	PRICE	
ZONES	World	Monthly/Quarterly	\$750.	\$260.
	North	Monthly/Quarterly	350.	140
	South	Quarterly	200.	70.
	Polar	Quarterly	200.	50.
REGIONS	U.S.A. (48), C. America	Monthly	95.	40.
	Alaska, Hawaii	Monthly	95.	40.
	South America	Quarterly	25.	7.
	Central and South America	Quarterly	45.	10.
	Australia and S.E. Asia	Quarterly	35.	10.
	Europe and North Africa	Quarterly	35	12.
	India, Burma, and Pakistan	Quarterly	25.	10.
	Middle East	Quarterly	20.	10.

¹One-year subscription: Update cycle is monthly for Paths 1-97, North Zone, and quarterly for the rest of the world.

²Current Catalog price: These catalogs include all accessions to the date of order, including the most recent update.



LANDSAT ACCESSION AIDS ZONE MAP (DAY)

Landsat-3 Launched

On March 5, Landsat 3 was launched by a Thor Delta rocket into a nearpolar, sun-synchronous orbit from Vandenberg Air Force Base Space and Missile Test Center, California. After orbital adjustments, the sensor system were turned on, and data from Landsat 3 are now being received and processed.

Landsat 3 is similar in design to the two preceding Landsats; however, the sensor systems carried onboard have been modified. The multi-spectral scanners (MSS) on Landsats 1 and 2 were designed to respond to Earth reflected sunlight in four spectral bands, whereas the Landsat 3 MSS carries an additional band responding to emitted thermal infrared radiation in the range of 10.4 to 12.6 micrometers. Band 8 will sense temperatures from -13°C to 67°C (260° to 340°K), with a temperature resolution of 1.5°C . The instantaneous field of view is nominally 237×237 meters. Band 8 will acquire nighttime thermal data during the satellites's ascending node.

The return-beam vidicon (RBV) camera system on Landsat 3 is significantly different from the RBV systems on the previous satellites. Two panchromatic cameras produce two side-by-side images rather than three overlapping multispectral images of the same scene. Each RBV camera sensor is designed to cover a 99×99 km area, with a total swath width of approximately 185 km. Four RBV images will coincide approximately with one MSS frame. A focal length of 23.6 cm (9.3 in.), or nearly twice that of Landsat 1 and 2 RBV, will nearly double the resolution for ground area mapping.

Landsat 3 also carries the space-borne relay component of a data collection system, as did Landsats 1 and 2. The data collection system on Landsat 2 was shut down during the launch of Landsat 3, and will not be turned on again. Landsat 3 is now relaying the data collection system information.

OBITUARY

Landsat 1 was officially retired on January 6, 1978, when continuous orbital degradation caused Landsat 1 to see almost constant sunlight and led to overheating of the S-band command and ranging system.

Landsat 1 (then ERTS 1) was launched July 23, 1972, with a planned orbital life of only one year. It functioned well for over five years and returned data for 300,000 images of the Earth's surface from space.

Interim Landsat Processing Plans for 1978

By September 1, 1978, GSFC expects the Ground Control Point (GCP) Library System for the Master Data Processor (MDP) to be operational. Ground control points, necessary to produce an image with accurate locations of terrain features, will then begin to be entered into the library.

During the library build-up period, Landsat 3 MSS images of bands 4, 5, 6, and 7, for which GCP's have been entered into the library, will be geometrically corrected and available to users. A "G" in field 76 of the 115 character image-annotation-data file on both photographic and tape products will indicate that geometric corrections were performed using ground control points.

An "R" in this same annotation field will indicate to users that scenes for which maps of reasonable accuracy do not exist have been registered by using relative control points in a reference Landsat scene. The geometric accuracy of these scenes will be limited by the performance of the

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INTERIM LANDSAT PROCESSING PLANS FOR 1978

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attitude measurement Sensor (AMS) and the accuracy of ephemeris data.

"System-level" corrected scenes, for which ground control points have not been selected, will be corrected to system-level accuracies depending on the spacecraft AMS performance and orbital ephemeris data. An "S" in field 76 will indicate system-level corrections performed without the use of ground control points.

A "U" in field 76 will indicate geometrically uncorrected imagery.

By mid to late summer, when the new digital systems are in full operation, the GSFC image processing facility (IPF) will produce geometrically and radiometrically corrected Landsat MSS and RBV scenes on high-density digital tapes (HDTs). Approximately 200 scenes can be processed per day. The EROS Data Center Digital Image Processing System (EDIPS) will further process the HDTs to produce the following products;

Computer compatible tapes, geometrically corrected or uncorrected, in band-sequential (BSQ) or band interleaved by line (BIL) formats for MSS data, and subscene sequential (SSQ) format for Landsat 3 RBV data.

Black and white positive or negative film transparencies, at scales ranging from 1:369,000 to 1:250,000 for MSS data, 1:684,500 to 1:125,000 for Landsat 3 RBV data.

Black and white and false color composite paper prints of MSS data, at scales from 1:1,000,000 to 1:250,000; Landsat 3 RBV data at scales from 1:500,000 to 1:125,000.

Direct copies of high density digital tapes of MSS or RBV data.

CALL FOR PAPERS

The Fourth William T. Pecora Memorial Symposium will be held October 10-12, 1978, in Sioux Falls, South Dakota. The theme is the Application of Remote Sensing Data to Wildlife Management. Invited papers will be presented during the symposium and contributed papers can be presented in *Poster Sessions*. All persons interested in contributing a poster session paper should submit a comprehensive summary of their proposed presentation no later than May 31, 1978. Summaries must be between 300 and 1000 words, typed double-space on one side only, and received prior to the above deadline. Ten copies, in English, should be submitted to:

*Dr. Michael E. Berger
National Wildlife Federation
1412 16th Street, NW
Washington, D.C. 20036
Phone: 202-797-6881*

Authors will be notified of acceptance of their proposed presentation by July 1, 1978.

LANDSAT DATA USERS NOTES

This is the second in a series of newsletters prepared by the EROS Data Center to help inform data users of the changes occurring within the Landsat and EROS Programs and remote sensing in general. Some recipients of this newsletter may also be receiving the "Landsat Newsletter", prepared at Goddard Space Flight Center (GSFC). However, approximately 8,500 people on our mailing list do not receive the "Landsat Newsletter". A combined newsletter is planned for the near future.

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EROS DATA CENTER TRAINING COURSES MAY THROUGH JULY, 1978

May	1-26	<i>10th International Remote Sensing Workshop</i> , at the EROS Data Center.
	8-12	<i>Introduction to Remote Sensing</i> , for Bureau of Land Management, at Phoenix, Arizona.
	22-26	<i>Introduction to Remote Sensing</i> , for Bureau of Land Management, at Boise, Idaho.
	30-June 2	<i>Geological Applications</i> , for Texas A & M, at the EROS Data Center.
June	5-10	<i>Strip Mine Monitoring</i> , for Federal and State officials, at the EROS Data Center.
	12-16	<i>Water Resources Division Remote Sensing Workshop</i> , at the EROS Data Center.
	12-16	<i>Vegetation Remote Sensing Workshop</i> , by the University of Michigan at the Michigan Biological Station, Pellston, Michigan.
	19-23	<i>Vegetation Remote Sensing Workshop</i> , by the University of Michigan, at Leelanau School, Glen Arbor, Michigan.
	19-23	<i>Terrain Analysis: Interpretation of Aerial Photos</i> by Harvard Graduate School of Design at EROS Data Center.
July 22-August	15	<i>Remote Sensing Training</i> , at Teheran, Iran.
	24-27	<i>Geological Applications</i> , for CIRCUM Pacific, at Honolulu, Hawaii.

FOR MORE INFORMATION ON THESE COURSES OR FUTURE COURSES, WRITE TO:

Chief, Training and Assistance Section
Applications Branch
U.S. Geological Survey
EROS Data Center
Sioux Falls, South Dakota 57198

NASA GODDARD SPACE FLIGHT CENTER REMOTE SENSING TRAINING COURSE

A limited number of spaces (3-5) are available in a two-week remote sensing training course sponsored by the Eastern Regional Remote Sensing Applications Program at NASA Goddard Space Flight Center. Tentative dates are June 19-30, 1978. Emphasis will be placed on utilization of digital processing of Landsat data for applications in land cover assessment, forestry, hydrology, and geology. First priority will be given to persons in State and local government organizations within the Eastern Region. Participants must provide their own support while attending.

For more information, contact:

Dr. Nicholas Short
Code 902.1
NASA Goddard Space Flight Center
Greenbelt, MD 20771
Phone: 301-982-5084
WATS: 800-638-0748

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IMAGE PROCESSING EQUIPMENT AND SERVICES

When the digital image processing systems (IPF and EDIPS) are in operation, the EROS Data Center will produce radiometrically and geometrically corrected Landsat photographic and tape products. These will include a standard product that has been radiometrically and geometrically corrected, including atmospheric effects correction (haze removal) and limited contrast enhancement. The EROS Data Center does not provide infor-

mation extraction, image interpretation, or data analysis services for the general public. To assist Landsat users in obtaining digital analysis services, the following list of manufacturers of analysis systems and services is provided. This list is based on the latest information available at the EROS Data Center, but may not be complete. Any omissions of companies or errors in this list, will, be corrected when called to our attention, in a future issue of the Notes.

IMAGE ANALYSIS HARDWARE SYSTEMS

Bendix Aerospace Systems Division
Ann Arbor, Michigan 48107
Contact: Bob Johnson
(313) 665-7766

Comtal Corporation
169 North Halstead
Pasadena, California 91107
Contact: Dr. John Tahl
(213) 793-2134

Control Data Corporation
2800 E. Old Shakopee Rd.
P. O. Box 1249
Minneapolis, MN 55440
Contact: George Swanlund
(612) 853-3728

ESL Incorporated
495 Java Drive
Sunnyvale, California 94086
Contact: John Baumgarner
(408) 734-2244

General Electric Company
Beltsville, Maryland 20705
Contact: Earl Schaller
(301) 345-6000

Interpretation Systems Inc.
P. O. Box 1007
Lawrence, Kansas 66044
Contact: Mr. Jerry D. Lent
(913) 842-5678

International Imaging Systems (I²S)
650 N. Mary Ave.
Sunnyvale, California 94086
Contact: Larry Dorie
(415) 969-2700

IMAGE PROCESSING AND SOFTWARE ANALYSIS

SYSTEMS	SOURCE
VICAR	COSMIC 112 Barrow Hall Athens, Georgia Contact: Professor W. Zipperer (404) 542-3265
SMIPS	
LARSYS	
ERMAN II	IBM 1322 Space Park Drive Houston, Texas 77058 Contact: Charles Gilmore (713) 333-3300

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IMAGE ANALYSIS SERVICES

- Calspan Corporation
P. O. Box 235
Buffalo, New York 14221
- Comptel Corporation
169 North Halstead
Pasadena, California 91107
Dr. John Tahl (213) 793-2134
- Computer Sciences Corporation (CSC)
8728 Colesville Road
Silver Springs, Maryland
Mr. Robert Cecil (301) 589-1545
- Denver Mineral Exploration Co. (DEMEX)
1100 W. Littleton Blvd, Suite 103
Littleton, Colorado 80120
Dr. Carl Kober (303) 795-6122
- Earth Satellite Corporation
7222 47th Street
Washington, S. C. 20015
Mr. Robert Gribben (301) 652-7130
- Environmental Remote Sensing Applications
Laboratory (ERSAL)
Oregon State University
Corvallis, Oregon 97331
Dr. Barry Schrupf (503) 754-3056
- Environmental Research Institute of Michigan
(ERIM)
Box 618
Ann Arbor, Michigan 48107
Dr. Marvin Holter (313) 994-1200
- ESL, Incorporated
495 Java Drive
Sunnyvale, California 94086
Mr. John Baumgarner (408) 734-2244
- General Electric Company
5030 Herzel Place
Beltsville, Maryland 20705
Mr. Earl Schaller (301) 982-6095
- Geo Images
P. O. Box 576
Altadena, California 91001
Dr. A. F. H. Goetz (213) 797-7200
- Geospectra Corporation
320 North-Main, Suite 301
Ann Arbor, Michigan 48108
Dr. R. K. Vincent (313) 994-3450
- Image Processing Institute
University of Southern California
University Park
Los Angeles, California 90007
Dr. William Pratt (213) 746-5514
- International Business Machines Corporation (IBM)
1800 Frederic Pike
Gaithersburg, Maryland 20760
Mr. Ralph Bernstein (202) 840-7043
- International Imaging Systems (I²S)
650 N. Mary Avenue
Sunnyvale, California 94086
Mr. Larry Dorie (415) 969-2700
- Laboratory for Application of Remote Sensing
(LARS)
Purdue University
West Lafayette, Indiana 47906
Mr. Terry Phillips (317) 749-2052
- Lockheed Electronics Company
16811 El Camino Real
Houston, Texas 77058
Mr. Robert R. Norris (713) 488-0080
- Office of Remote Sensing of Earth Resources
(ORSER)
The Pennsylvania State University
University Park, Pennsylvania 16802
Dr. George McMurtry (812) 865-9753
- Pattern Recognition - Technology and Application
S. S. Viglione and Associates
551 Peralta Hills Drive
Anaheim, California 92807
Mr. Sam S. Viglione (714) 998-3620
- Remote Sensing Center
Texas A & M University
College Station, Texas 77843
Dr. Bruce J. Blanchard (713) 845-5422
- Remote Sensing Institute
South Dakota State University
Harding Hall
Brookings, South Dakota 57006
Mr. Victor L. Myers (605) 688-4184
- Remote Sensing Laboratory
School of Earth Sciences
Stanford University
Stanford, California
Dr. Ronald J. P. Lyon (213) 497-3262
- Space Sciences Laboratory
University of California
Berkeley, California 94720
Dr. Robert N. Colwell (415) 642-1353
- TRW System Group
One Space Park
Redondo Beach, California 90278
Dr. Sam Rifman (213) 535-0312
- The University of Kansas
Space Technology Center
Lawrence, Kansas 66045
Dr. Robert Haralick (913) 864-3542

LANDSAT DATA USERS NOTES

READER RESPONSE

FIRST NAME		LAST NAME	
ADDRESS			
CITY			
STATE		ZIP CODE	
COUNTRY			

I wish to receive future issues of the Landsat Data Users Notes.

I am interested in purchasing _____ copy(s) of the Landsat Data Users Handbook, Revised (for information only; order forms will be in subsequent issues of the Notes).

I wish to obtain the following documents when they are available (check both, if desired):

- Computer Compatible Digital Tapes, EDIPS Format
- Black-and-White and Color Photographic Products

COMMENTS _____

MAIL THIS RESPONSE TO:

User Services
EROS Data Center
U.S. Geological Survey
Sioux Falls, SD 57198

DO NOT MAIL THIS FORM IF YOU SENT IN ONE FROM ISSUE NO. 1